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Research Article

Bacterial Spectrum and Antibiotic Sensitivity in Patients with Chronic Dacryocystitis Attending at a Tertiary Hospital in Dhaka

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Abstract

Purpose: The purpose of the study was to assess the bacterial spectrum in patients with chronic dacryocystitis and their antibiotic sensitivity pattern.

Methods: This cross-sectional observational study was carried out in the Department of Ophthalmology, Department of Community Ophthalmology and Department of Microbiology and Immunology of Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka from March 2017 to August 2019. A total of 50 patients of 19 years and above with clinically diagnosed cases of chronic dacryocystitis were enrolled in this study.

Results: Most of the patients belonged to 46-55 years of age and male to female ratio was 1:2.8. About 60% of the population were housewives followed by 8 (16%) service holders and 7 (14%) businessmen. More than one third (34.0%) of the patients were culture positive and 66.0% were culture negative. Four cases had Gram positive bacteria; among them 3 (75%) were *Staphylococcus aureus*. Thirteen patients had Gram negative bacteria, among which *Klebsiella* spp was found in 9 (69.2%). The most common isolated bacterial organisms were *Klebsiella* spp 9(52.9%) followed by *Staphylococcus aureus* 3(17.6%) and *Acinetobacter* Spp

2(11.8%). In Gram positives *Staphylococcus aureus* and *Streptococcus pyogenes* had maximum sensitivity to Amoxycillin (100.0%), Chloramphenicol (100.0%), Tobramycin (100.0%), Ceftazidime (100.0%) and Gentamycin (100.0%). All the Gram negative organisms were 100% resistant to Amoxycillin and 100% sensitive to Tobramycin. *Klebsiella* spp was maximum sensitive to Tobramycin (100%) and Ceftazidime (100%).

Conclusion: Bacterial pathogens among Gram positive isolate was *Staphylococcus aureus* and *Streptococcus pyogenes* 100% sensitivity to Amoxycillin, Chloramphenicol, Tobramycin, Ceftazidime and Gentamycin whereas Gram negative had shown resistance to Amoxycillin.

Keywords: Dacryocystitis; Nasolacrimal Duct; Bacteria; Culture and Sensitivity; Epiphora

Introduction

Dacryocystitis is the obstruction of nasolacrimal duct or nasolacrimal sac leading to its acute or chronic inflammation, the most common site being lacrimal sac [1,2]. It may be congenital or acquired. Acquired dacryocystitis might present in two forms i.e., acute and chronic. Acute dacryocystitis is an acute inflammation of the lacrimal sac with tenderness and erythema of the overlying tissues. Chronic dacryocystitis affects more commonly than acute dacryocystitis and has several stages of presentation like epiphora, mucoid discharge, conjunctival hyperaemia and chronic conjunctivitis [3,4]. The cause for different presentation may be related to microbial pathogenesis of dacryocystitis and there are patterns of geographical variation in the microbiology of acute and chronic dacryocystitis. Additionally, different nasal pathologies seem to have a crucial role in developing dacryocystitis [5,6].

Dacryocystitis has a greater incidence among the people living in tropical countries with poor hygienic conditions. It occurs both in infants and adults, in men and women [7]. It commonly affects females over 40 years of age with peak incidence in 60 to 70 years. It is more common in Whites than in Negros and more common in India as being tropical country. It has higher incidence among people of lower socioeconomic status [8]. The causes of acquired obstruction are infection, inflammation, neoplasms and trauma [9].

Dacryocystitis can become a life-threatening infection with the potential to progress to orbital cellulitis and/or orbital abscess, meningitis, or cavernous sinus thrombosis [10]. Several bacteria have been implicated as causative agents of chronic dacryocystitis [11]. Due to inadvertent use of antibiotics and microbiological resistance, there is a change in the spectrum of agents responsible for chronic dacryocystitis [12]. A North Indian study evaluated the current pattern of microbial isolates and their antibiotic sensitivity patterns in patients of chronic dacryocystitis. Out of which 61.0% were sterile and 39.0% were positive for microbial agents. *Staphylococcus aureus* 54.6% was the most common Gram-positive cocci followed by coagulase negative *Staphylococcus epidermidis* 19.4%, followed by *Streptococcus pneumoniae* 14.0%. Gram negative organisms included *Pseudomonas aeruginosa* 6.0% followed by *Klebsiella pneumoniae* 3.0% and *Hemophilus influenzae* 3.0%. Gram positive bacteria were highly sensitive to Vancomycin and Fluoroquinolones and Gram-negative cases were sensitive to Piperacillin/Tazobactam [13].

Materials and Methods

This cross-sectional study was carried out at department of Ophthalmology, department of Community Ophthalmology and department of Microbiology and Immunology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka during the period of March 2017 to August 2019. Patients attending into department of Ophthalmology and department of Community Ophthalmology OPD, Bangabandhu Sheikh Mujib Medical University (BSMMU) who were diagnosed as case of chronic dacryocystitis were the study population. Purposive consecutive sampling technique were applied to collect the sample from the study population**.** The patients age 19 years and above and clinically diagnosed cases of chronic dacryocystitis were selected. Total numbers of 50 patients were enrolled in the study. All cases of pseudo-epiphora and epiphora caused by diagnoses other than nasolacrimal duct obstruction, patients with DM, patients with maxillofacial surgery or maxillofacial trauma, patients who received any topical or systemic antibiotics for the past one month, patient with previous any ocular infection, patient with history of DCR/DCT, with acute or acute on chronic dacryocystitis were excluded from the study.

Study procedure and design

The study was conducted in full accord with the tenets of the Declaration of Helsinki. Detailed information and informed consent were provided to each participant before inclusion. Chronic dacryocystitis were diagnosed in patients with painless swelling at the inner canthus, persistent epiphora and regurgitation of mucoid or mucopurulent material on pressure over the sac area or during irrigation of the lacrimal drainage system.

Procedure of sample collection, Gram staining and Bacterial culture

The collection of the samples has performed by applying pressure over the lacrimal sac and allowing the purulent material to reflux through the lacrimal punctum, or by irrigating the lacrimal drainage system with sterile saline and collecting the sample from the refluxing material. The samples were collected with sterile cotton wool swabs, ensuring that the lid margins or the conjunctiva were not touched**.** The samples were transported to the laboratory immediately and processed. The first swab was used for Gram staining and the second one was immediately inoculated into culture media like blood agar, chocolate agar, MacConkey. Blood agar and chocolate agar were incubated at 37°C for 24 hours. The plates were observed on the next day. The isolated organisms were identified by using standard procedures. Colony characteristic were noted down. Gram staining was done to identify whether the organism grown will be Gram-positive or Gram-negative. The smear was prepared by rolling the swab on a clean grease free glass slide. Smears was spread evenly covering on area of about 15-20 mm diameter on a slide. After air drying gentle heat fixation was done. Then fixed smear was covered with crystal violet stain for 30-60 seconds. Stain was washed off with clean water rapidly. Smear then covered with Lugol's iodine for 30-60 seconds and washed off the iodine with clean water. Decolorization done rapidly (few seconds) with acetone-alcohol. Then washed immediately with clean water, covered the smear with neutral red stain for 2 minutes. Stain was washed off with clean water. Back of the slide was cleaned and placed in a draining rack for the smear to air-dry. Examination of the smear was done microscopically. Gram positive bacteria were identified as dark purple colour and Gram-negative bacteria were pale to dark red.

Antimicrobial susceptibility tests

The standardized Kirby-Bauer disc diffusion test of the Clinical and Laboratory Standards Institute (CLSI) were used for testing. The media used were Mueller-Hinton agar for non-fastidious organisms. 5% Sheep Blood agar were added to Mueller-Hinton agar for fastidious organism and it were read after 16-18 hours. Inoculum turbidity was adjusted to 0.5 McFarland turbidity tube. A lawn culture was made on the surface of medium using sterile cotton swabs and antimicrobial discs were applied. The plates were incubated for 18-24 hours for non-fastidious organisms and under 5% CO2 for 24-48 hours at 37 degrees Celsius for fastidious organisms. The zones of inhibition were measured and reported as susceptible or resistant. For detection of Methicillin resistant *Staphylococcus aureus* (MRSA), Oxacillin disc (10 microgram) was used on Mueller-Hinton agar containing 2% sodium chloride.

Data Collection, processing and analysis

The demographic information, relevant history, clinical examination findings and culture findings of all the study subjects were recorded in the data collection sheet. The statistical analysis was carried out using the Statistical Package for Social Sciences version 22.0 for Windows (SPSS Inc., Chicago, Illinois, USA). Qualitative variables such as organisms cultured of this study has expressed as frequency and percentage. The results were presented in tables, figures, diagrams and p value < 0.05 was considered significant.

Results

In this present study, it was observed that 28.0% populations belonged to age 46-55 years followed by 20.0% 36-45 years, 20.0% 56-65 years, 18.0% 26-35 years, 8.0% 66 years and above and 6.0% belonged to 19-25 years (Figure 1). It was observed that chronic dacryocystitis was predominant in female subjects, where 74.0% patients were female and 26.0% male and male to female ratio was 1:2.8 (Figure 2). In this current study, it was observed that 60.0% were housewives followed by 16.0% service holders, 14.0% businessmen, 6.0% student/others, 2.0% cultivator and 2.0% were day laborer (Figure 3). The prevalence of Dacryocystitis was higher in female subjects and most females were housewives in this study. In this current study, it was observed that 34.0% patients were culture positive and 66.0% were culture negative (Figure 4). In this study the most common isolated bacterial organism was *Klebsiella* spp (52.9%) followed by *Staphylococcus aureus* (17.6%), *Acinetobacter* Spp (11.8%) and *Streptococcus pyogenes, Pseudomonas* spp *and Escherichia coli* were (5.9%) each (Figure 5). In this present study, Tobramycin was sensitive for all Isolated bacterial organisms. *Streptococcus pyogenes* was sensitive to all the antibiotics tested

in this study. Amoxycillin was sensitive for *Streptococcus pyogenes* and *Staphylococcus aureus and* 100.0% resistant for Gram negative organisms *Staphylococcus aureus* was highly sensitive to all the antibiotics except ciprofloxacin (33.3% sensitive). *Pseudomonas* spp, *Escherichia coli* and *Klebsiella* were highly sensitive to all the antibiotics except amoxycillin. *Acinetobacter* Spp was less sensitive (50% sensitive) to Ciprofloxacin and Ceftazidime (Table 1).

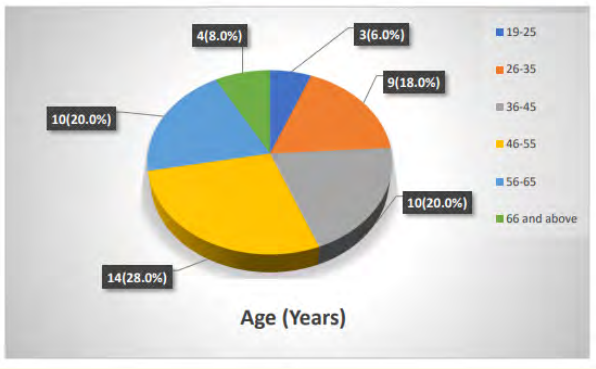

Figure 1: Pie chart showing age of the study population.

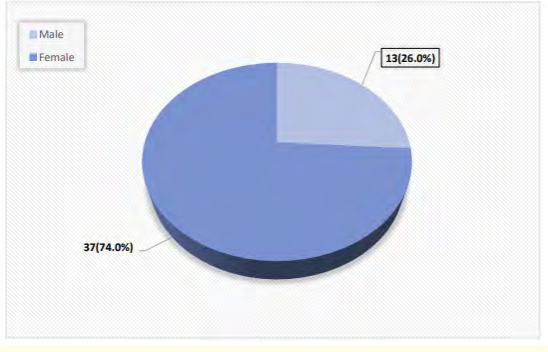

Figure 2: Pie chart showing gender of the study population.

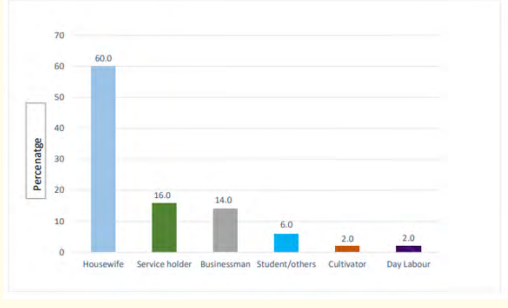

Figure 3: Bar diagram showing occupation of the study population.

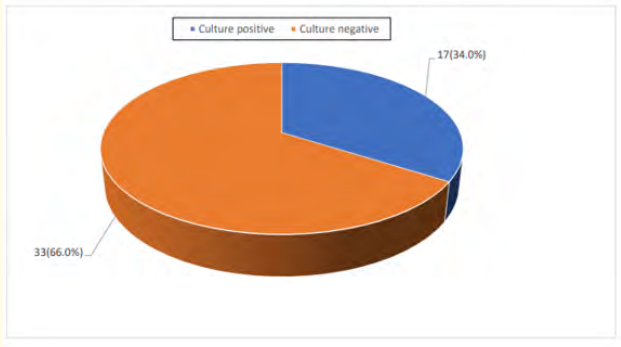

Figure 4: Pie chart showing culture positivity in study populations.

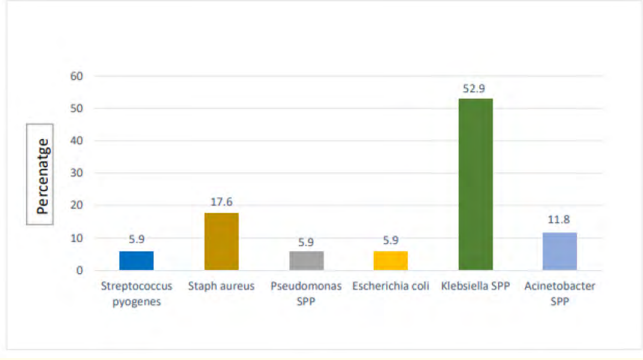

Figure 5: Bar diagram showing distribution of bacterial isolates in culture positivity cases (N = 17).

Discussion

Chronic dacryocystitis is more common than acute dacryocystitis and has several stages of presentation like epiphora, mucoid discharge, conjunctival hyperaemia and chronic conjunctivitis [3]. The reason for different presentation may be related to microbial pathogenesis of dacrocystitis and there are patterns of geographical variation in the microbiology of acute and chronic dacryocystitis. Additionally, different nasal pathologies seem to have a crucial role in developing dacryocystitis [5,6].

A study reported that the incidence of chronic dacryocystitis has been observed to be directly proportional to the age [13]. In this present study, it was observed that 28.0% population belonged to age 46-55 years followed by 20.0% in 36-45 year group, 20.0%

Drugs	S/R	Isolated bacterial organisms					
		Streptococcus pyogenes **(n = 1)**	***Staph aureus*** **(n = 3)**	***Pseudomonas spp*** **(n = 1)**	***Escherichia coli*** **(n = 1)**	***Klebsiella spp*** **(n = 9)**	***Acinetobacter Spp*** **(n = 2)**
Amoxycillin	S	1(100.0%)	3(100.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)
	R	0(0.0%)	0(0.0%)	1(100.0%)	1(100.0%)	9(100.0%)	2(100.0%)
Chloramphenicol	S	1(100.0%)	3(100.0%)	1(100.0%)	1(100.0%)	8(88.9%)	2(100.0%)
	R	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	1(11.1%)	0(0.0%)
Tobramycin	S	1(100.0%)	3(100.0%)	1(100.0%)	1(100.0%)	9(100.0%)	2(100.0%)
	R	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)
Ciprofloxacin	S	1(100.0%)	1(33.3%)	1(100.0%)	1(100.0%)	8(88.9%)	1(50.0%)
	R	0(0.0%)	2(66.7%)	0(0.0%)	0(0.0%)	1(11.1%)	1(50.0%)
Ceftazidime	S	1(100.0%)	3(100.0%)	1(100.0%)	1(100.0%)	9(100.0%)	1(50.0%)
	R	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	1(50.0%)
Gentamycin	S	1(100.0%)	3(100.0%)	1(100.0%)	1(100.0%)	8(88.9%)	2(100.0%)
	R	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	1(11.0%)	0(0.0)

Table 1: Antimicrobial drug susceptibility pattern of the isolated organisms (N = 17).

Note: S = Sensitive and R = Resistant.

in 56-65 year group, 18.0% in 26-35 year group, 8.0% were 66 years or above and 6.0% belonged to 19-25 year age group. Similarly, a study observed 115 chronic dacryocystitis and most of the population (52.1%) were above 40 years followed by 18.2% population in 31-40 years, 13.9% were in 21-30 years, 12.1% and 3.4% populations were in the age group of 11-20 years and 1-10 years respectively [14].

It has been reported that the prevalence of Dacryocystitis is predominantly higher in females [15]. Another study mentioned that the incidence of dacryocystitis was 3 times more in women than men [13]. Similarly, in this current study, it was also observed that chronic dacryocystitis was predominant in female subjects (Male:Female = 1: 2.8).

Dacryocystitis prevalence mostly common in female subjects and most females were housewife in this study. In a study conducted in Northwest Ethiopia, patients with adulthood age group and occupationally engaged in agricultural activities were more affected by dacryocystitis [16].

In this current study, it was observed that 34.0% patients were culture positive and 66.0% culture negative. Similarly, in North India there was 400 samples, culture showed 39.0% were positive, which is similar with the present study [13]. In another study evaluated 42 clinical samples, out of which 78.5% were culture positive and 21.5% were culture negative, which differ with the present study [21]. In this study the most common isolated bacterial organisms were *Klebsiella* spp 52.9% followed by *Staphylococcus aureus* 17.6%, *Acinetobacter* Spp 11.8% and *Streptococcus pyogenes, Pseudomonas spp and Escherichia coli* were 5.9% each. Many studies documented that *Staphylococcus aureus* is the most common pathogen isolated from dacryocystitis [14-21].

In this present study Tobramycin was most sensitive for all Isolated bacterial organisms followed by Chloramphenicol, Gentamycin, Ceftazidime and Ciprofloxacin. However, Amoxycillin was sensitive for *Streptococcus pyogenes* and *Staphylococcus aureus and* 100.0% resistant for *Pseudomonas* spp, *Escherichia coli, Klebsiella* spp and *Acinetobacter* Spp. Kandati J., *et al*. suggested that Tobramycin is the best therapeutic drug in cases of dacryocystitis caused by Gram negative pathogen and Bacitracin is effective in both type of pathogens. *Escherichia coli* showed maximum sensitivity to Amikacin 95.0%, Gentamicin 92.0%, Bacitracin 94.0% and maximum resistance was exhibited to Chloramphenicol 56.0%

and Tetracycline 40.0%. *Klebsiella pneumoniae* exhibited maximum resistance to Chloramphenicol 44.0% and Tetracycline 38% [19]. A study about antibiotic sensitivity pattern suggested that Chloramphenicol, was effective against Gram positive organisms whereas Piperacillin/Tazobactam, Imipenem, Chloramphenicol and Amikacin were effective against Gram negative organisms [13]. Another study observed most of the isolates of *Staphylococcus aureus* were sensitive to Ciprofloxacin (82.9%), followed by Cefuroxime (60.9%). In case of *Streptococcus pneumoniae*, Gentamycin shows highest sensitivity (100%) followed by Vancomycin 66.6%. The sensitivity among *Escherichia coli* were highest for Ceftazidime Tazobactam (CAT) 70.1%. Most of the isolates of *Pseudomonas aeruginosa* showed utmost sensitivity to Ceftazidime tazobactam (CAT) 80.0% followed Gentamycin 60.0% [21].

Conclusion

Dacryocystitis pose a constant threat to cornea and orbital soft tissue. It is important to have knowledge of the microbial agent responsible for chronic dacryocystitis of the geographical area along with the antibiotic sensitivity pattern to choose the most appropriate antibiotic for the implicated organism. The most common isolated bacterial organisms in this study were *Klebsiella* spp, *Staphylococcus aureus* and *Acinetobacter* Spp. We have found that Gram positive *Staphylococcus aureus* and *Streptococcus pyogenes* were 100% sensitive to Amoxycillin, Chloramphenicol, Tobramycin, Ceftazidime and Gentamycin whereas Gram negative bacteria showed resistance to Amoxycillin.

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Conflict of Interest

No conflict of interest.

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Bibliography

1. 1S Agarwal., *et al*. "Textbook of Ophthalmology". 1/e, vol. 2, Jaypee Brothers Publishers, (2002).
2. Nigam Eesh., *et al*. "Age wise microbiological profile in chronic dacryocystitis". *AIOC 2008 Proceedings* (2008).
3. Ali Mohammad Javed., *et al*. 'The Microbiological Profile of Lacrimal Abscess: Two Decades of Experience from a Tertiary Eye Care Center'. *Journal of Ophthalmic Inflammation and Infection* 3.1 (2013): 57-57.
4. Ali Mohammad Javed., *et al*. "Clinical profile and management outcome of acute dacryocystitis: two decades of experience in a tertiary eye care center". *Seminars in Ophthalmology* 30.2 (2015): 118-123.
5. Mills David M., *et al*. "The microbiologic spectrum of dacryocystitis: a national study of acute versus chronic infection". *Ophthalmic Plastic and Reconstructive Surgery* 23.4 (2007): 302-306.
6. Bharathi M J., *et al*. "Comparative bacteriology of acute and chronic dacryocystitis". *Eye (London, England)* 22.7 (2008): 953-960.
7. Sharat Soumya and KS Nagaraja. "A study on the epidemiology of chronic dacryocystitis in an economically-deprived population in South India". *Journal of Evolution of Medical and Dental Sciences* 5.70 (2016): 5116.
8. Gillil GD. "Texas Ophthalmic Plastic". *Reconstructive Orbital Surgery Associates eMed Space, opthal lacrimal* August 18 (2009).
9. Yanoff M and JS Duker. "The Lacrimal Drainage System". Ophthalmology, 2nd ed., Mosby Publication, (2003): 1678.
10. Mauriello J A Jr and B A Wasserman. "Acute dacryocystitis: an unusual cause of life-threatening orbital intraconal abscess with frozen globe". *Ophthalmic Plastic and Reconstructive Surgery* 12.4 (1996): 294-295.
11. Pinar-Sueiro Sergio., *et al*. "Dacryocystitis: Systematic Approach to Diagnosis and Therapy". *Current Infectious Disease Reports* 29 (2012).
12. Briscoe Daniel., *et al*. "Changing bacterial isolates and antibiotic sensitivities of purulent dacryocystitis". *Orbit (Amsterdam, Netherlands)* 24.1 (2005): 29-32.

13. Ahuja S., *et al*. "Study of Bacterial Spectrum in Patients of Chronic Dacryocystitis, at a Tertiary Care Centre in Northern India". *Journal of Community Medicine and Health Education* 7.536 (2017): 2161-0711.

14. Padmavathi C G and Ravi Prakash Gattu Nadiminiti. "A study on Bacteriological profile of Dacryocystitis Cases attending to Government General Hospital, Anantapuramu". *World Journal of Pharmaceutical Sciences* (2017): 313-316.

15. "Oculoplastics/Orbit: Dacryocystitis Practicing Ophthalmologists Learning System 2017-2019". American Academy of Ophthalmology, American Academy of Ophthalmology, (2017).

16. Assefa Yared., *et al*. "Bacteriological profile and drug susceptibility patterns in dacryocystitis patients attending Gondar University Teaching Hospital, Northwest Ethiopia". *BMC Ophthalmology* 15 (2015): 34.

17. Prathiba., *et al*. Microbiological Study of Dacryocystitis in Paediatric Age Group. 3 (2016): 892-894.

18. Gümüssoy Murat., *et al*. "Clinical and microbiological evaluation of the culture results of the patients with chronic dacryocystitis at a tertiary care hospital". *ENT Updates* 6.1 (2016): 34.

19. Kandati Jithendra., *et al*. "Microbial surveillance of acute and chronic dacryocystitis in a tertiary care hospital". *Journal of Evolution of Medical and Dental Sciences* 4.3 (2015): 408-415.

20. Eshraghi Bahram., *et al*. "Microbiologic spectrum of acute and chronic dacryocystitis". *International Journal of Ophthalmology* 7.5 (2014): 864.

21. Gahlot Abha., *et al*. "Microbiologic spectrum of acute and chronic dacryocystitis". *National Journal of Medical Research* 6.04 (2016): 305-308.